

WHAT IS CLAIMED IS:

5 *Sub C1*  
1. ~~A method for deriving a reverse model~~  
look-up table whose entries represent device  
dependent colors as a function of device independent  
colors, based on a forward model look-up table whose  
entries represent device independent colors obtained  
in response to printout of corresponding device  
dependent color components, wherein the forward  
10 model and the reverse model look-up tables both  
comprise a grid of cells in their respective color  
spaces with entries at each grid point of the grid,  
the method comprising the following steps to  
determine an entry in the reverse model look-up  
15 table for a device independent target color:

performing a binary search of the forward  
model look-up table to locate a cell that contains  
the device independent target color;

20 interpolating entries from the forward  
model look-up table at grid points that define the  
cell so as to obtain device dependent colors  
corresponding to the device independent target  
color; and

25 storing the device dependent color at the  
grid point of the reverse model look-up table for  
the device independent target color.

30 2. A method according to Claim 1, wherein  
said interpolating step comprises tetrahedral  
interpolation.

35 3. A method according to Claim 1, wherein  
said step of performing a binary search comprises  
iterated steps starting from a starting color value  
in device dependent color space, the iterated steps  
comprising:

5                   determining which of the multiple regions  
                  contains the device independent target color; and  
                  updating the starting color value based on  
                  which region contains the device independent target  
                  color.

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~~10. An apparatus according to Claim 8,  
wherein said search performing means comprises means~~

~~for performing iterated steps starting from a  
starting color value in device dependent color  
space, the iterated steps comprising:~~

5       dividing the device independent color space  
into multiple regions defined by device independent  
colors corresponding to small variations from the  
starting color in device dependent color space;

10       determining which of the multiple regions  
contains the device independent target color; and  
      updating the starting color value based on  
which region contains the device independent target  
color.

15       11. An apparatus according to Claim 10,  
wherein said determining means comprises means for  
obtaining dot products for each normal plane vector  
that defines the multiple regions with the vector  
that defines the difference between the target color  
20       and the device independent color corresponding to  
the starting color, and determining which region  
contains the device independent target color in  
accordance with which of the dot products yields  
positive values and which yields negative values.

25       12. An apparatus according to Claim 8,  
wherein the device independent color space is CIEXYZ  
or CIELAB color space, and wherein the device  
dependent color space is CMY or CMYK color space.

30       13. An apparatus according to Claim 8,  
wherein the forward model look-up table is derived  
by printing color patches corresponding to  
predefined colors in device dependent color space,  
and measuring the colors of the patches in device  
35       independent color space.

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5 14. An apparatus according to Claim 8, wherein the predefined colors are in CMY or CMYK space, and the colors are measured in CIEXYZ or CIELAB space.

10 15. Computer-executable process steps stored on a computer-readable medium, the computer executable process steps to derive a reverse model look-up table whose entries represent device dependent colors as a function of device independent colors, based on a forward model look-up table whose entries represent device independent colors obtained in response to printout of corresponding device dependent color components, wherein the forward model and the reverse model look-up tables both comprise a grid of cells in their respective color spaces with entries at each grid point of the grid, the computer-executable process steps comprising the following codes to determine an entry in the reverse model look-up table for a device independent target color:

15 code to perform a binary search of the forward model look-up table to locate a cell that contains the device independent target color;

20 code to interpolate entries from the forward model look-up table at grid points that define the cell so as to obtain device dependent colors corresponding to the device independent target color; and

25 code to store the device dependent color at the grid point of the reverse model look-up table for the device independent target color.

30 16. Computer-executable process steps according to Claim 15, wherein said code to interpolate comprises code to perform tetrahedral interpolation.

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~~20. Computer-executable process steps~~

according to Claim 15, wherein the forward model look-up table is derived by codes to print color patches corresponding to predefined colors in device dependent color space, and to measure the colors of the patches in device independent color space.

~~21. Computer-executable process steps~~

according to Claim 15, wherein the predefined colors are in CMY or CMYK space, and the colors are measured in CIEXYZ or CIELAB space.

~~22. A computer-readable medium which~~

stores computer-executable process steps, the computer-executable process steps to derive a reverse model look-up table whose entries represent device dependent colors as a function of device independent colors, based on a forward model look-up table whose entries represent device independent colors obtained in response to printout of corresponding device dependent color components, wherein the forward model and the reverse model look-up tables both comprise a grid of cells in their respective color spaces with entries at each grid point of the grid, the computer-executable process steps comprising the following steps to determine an entry in the reverse model look-up table for a device independent target color:

a search performing step to perform a binary search of the forward model look-up table to locate a cell that contains the device independent target color;

an interpolating step to interpolate entries from the forward model look-up table at grid points that define the cell so as to obtain device dependent colors corresponding to the device independent target color; and

a storing step to store the device dependent color at the grid point of the reverse model look-up table for the device independent target color.

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23. A computer-readable medium according to Claim 22, wherein said interpolating step comprises tetrahedral interpolation.

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24. A computer-readable medium according to Claim 22, wherein said search performing step comprises iterated steps starting from a starting color value in device dependent color space, the computer-executable process steps comprising:

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a dividing step to divide the device independent color space into multiple regions defined by device independent colors corresponding to small variations from the starting color in device dependent color space;

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a determining step to determine which of the multiple regions contains the device independent target color; and

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an updating step to update the starting color value based on which region contains the device independent target color.

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25. A computer-readable medium according to Claim 24, wherein said determining step comprises steps to obtain dot products for each normal plane vector that defines the multiple regions with the vector that defines the difference between the target color and the device independent color corresponding to the starting color, and to determine which region contains the device independent target color in accordance with which of the dot products yields positive values and which yields negative values.

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5 26. A computer-readable medium according to Claim 22, wherein the device independent color space is CIEXYZ or CIELAB color space, and wherein the device dependent color space is CMY or CMYK color space.

10 27. A computer-readable medium according to Claim 22, wherein the forward model look-up table is derived by steps to print color patches corresponding to predefined colors in device dependent color space, and to measure the colors of the patches in device independent color space.

15 28. A computer-readable medium according to Claim 22, wherein the predefined colors are in CMY or CMYK space, and the colors are measured in CIEXYZ or CIELAB space.

20 29. An apparatus for deriving a reverse model look-up table whose entries represent device dependent colors as a function of device independent colors, based on a forward model look-up table whose entries represent device independent colors obtained in response to printout of corresponding device dependent color components, wherein the forward model and the reverse model look-up tables both comprise a grid of cells in their respective color spaces with entries at each grid point of the grid, the apparatus comprising:

25 30 a memory including a region for storing the forward model look-up table, a region for storing the reverse model look-up table, and a region for storing executable process steps; and

35 a processor for executing the executable process steps;

wherein the executable process steps include the following steps to determine an entry in

the reverse model look-up table for a device independent target color: (a) performing a binary search of the forward model look-up table to locate a cell that contains the device independent target color, (b) interpolating entries from the forward model look-up table at grid points that define the cell so as to obtain device dependent colors corresponding to the device independent target color, and (c) storing the device dependent color at the grid point of the reverse model look-up table for the device independent target color.

30. An apparatus according to Claim 29, wherein said step of performing a binary search comprises iterated steps starting from a starting color value in device dependent color space, the iterated steps comprising:

dividing the device independent color space into multiple regions defined by device independent colors corresponding to small variations from the starting color in device dependent color space;

determining which of the multiple regions contains the device independent target color; and

updating the starting color value based on which region contains the device independent target color.